7.0 Full Build-Out Estimates

> ***Key Point: Full Build-Out Estimates***
> ERG projects that emissions from natural gas production operations in Fort Worth will peak in 2012 and 2013 before beginning to decline.

Over the last five years, there has been a dramatic increase in natural gas production in the Barnett Shale, and in the city of Fort Worth itself. The expansion of the natural gas industry within the city is expected to continue into the future, and emissions from these activities are also expected to increase. ERG has developed estimates of total emissions from natural gas production from 2010 to 2018, based on the results of the point source testing task. As described below, ERG projects that emissions from natural gas production will peak in 2012 and 2013, and will slowly decline over time as the known natural gas reserves in the Barnett Shale are depleted. In this context, "full build-out" means the point at which natural production will result in the maximum annual emissions. For purposes of this evaluation, total emissions from natural gas production activity are assumed to correlate to total natural gas production levels.

This evaluation includes emissions from production activities (all emission sources found at producing well pads, compressor stations, and the gas processing plant), but does not include emissions from pre-production activities such as site construction, exploration (drilling), stimulation (fracking), or well completion.

One drilling operation, one fracking operation, and one well completion operation were visited under the point source testing task, and emissions estimates were developed for each of these operations. However, this information was insufficient to extrapolate to all drilling, fracking, and completion operations occuring in 2010 due to the variability in how these operations are conducted from well to well, and from operator to operator. Additionally, the single saltwater treatment facility located in Fort Worth was also visited. However, emissions at the time of the visit were determined to be very small (less than half a pound of VOC per year).

This section has five sub-sections:

- 7.1 Factors Affecting Natural Gas Production – This section describes the various factors that must be considered when predicting future natural gas production.
- 7.2 Methodology for Forecasting Natural Gas Production – A description of the methodology used to estimate future natural gas production is provided in this section.
- 7.3 2010 Base Year Emissions Inventory – Describes how the current (2010) emissions inventory was compiled.
- 7.4 2010 through 2018 Projected Emissions Inventories – This section describes how the emissions estimates for 2011 – 2018 were calculated.
- 7.5 Full Build-Out Estimates Conclusions – This section presents the conclusions of the full build-out component of this study.

7.1 Factors Affecting Natural Gas Production

> ***Key Point: Drilling and Permit Activity***
> By 2010, the number of active drill rigs and the number of well pad permits issued by the City of Fort Worth were down nearly 60% from their 2008 highs.

Estimating the future production of natural gas depends upon several factors. The primary factors include the amount of recoverable natural gas in the Barnett Shale formation, the ability of operators to access the gas with available drilling and fracturing methods (amounts technically recoverable), and the economics of the extraction process (amounts economically recoverable). Other operational factors include the number of existing producing wells, the depletion rate of existing wells, the number of new wells drilled, and the initial production from new wells, all of which contribute to the amounts of gas technically recoverable. These operational factors depend on the wellhead price of natural gas (price received by producers) and the costs of extracting the gas.

While the amount of recoverable gas in the Barnett Shale is finite, there will still be technically recoverable natural gas decades from now. However, the rate at which this gas is extracted will depend on the price received and the costs of drilling wells, installing production infrastructure such as pipelines and compressor stations, and the costs of operating these facilities.

The amount of recoverable gas in the Barnett Shale area is unknown. Current estimates of gas reserves in the Barnett Shale vary from 25 to 30 trillion cubic feet. This is not an absolute figure, as estimates of proven reserves and recoverable reserves change year by year. Reserve estimates increase as new data is obtained from exploration and drilling activities, while gas reserves are depleted as gas is extracted from existing wells. The Barnett Shale is unique in that it is the first domestic shale gas play to be extensively drilled and developed. Therefore, there is a wealth of information available about the size of the resource. In 2007, the Perryman Group estimated economically recoverable reserves of gas in the Barnett Shale at 2 trillion cubic feet and technically recoverable reserves at 30 trillion cubic feet.[21] The U.S. Energy Information Administration's most recent estimate of shale gas reserves for the three Texas Districts (Districts 5, 7B, and 9) that include Barnett Shale acreage is 26.47 trillion cubic feet.[22]

Figure 7.1-1 shows natural gas production in the entire Barnett Shale and in Tarrant County since 1993.[23] Notice that, over time, production of shale gas in Tarrant County has mirrored the larger trend in the entire Barnett Shale region. Due to the availability of county-level data from the Railroad Commission of Texas, this analysis uses current and projected production data for Tarrant County as a surrogate to reflect current and projected production data for the city of Fort Worth.

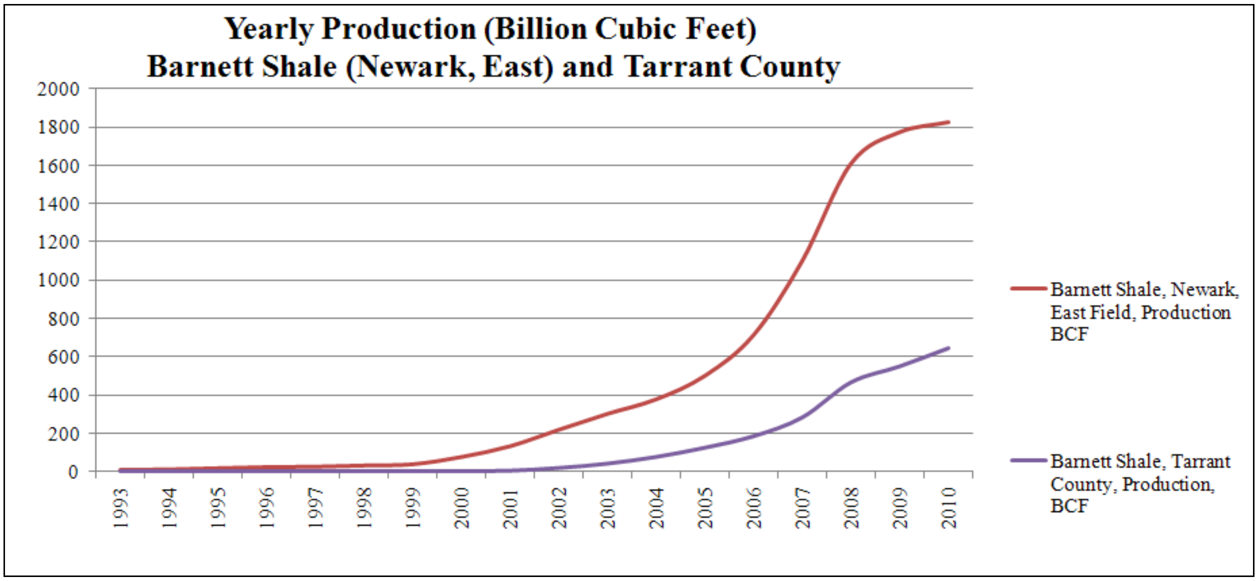


Figure 7.1-1. Natural Gas Production in the Barnett Shale and Tarrant County (1993–2010)

The price received for natural gas (the wellhead price) has a significant effect on the extent of exploration and the amount of gas produced. Higher wellhead prices stimulate increased exploration, drilling, and production. Figure 7.1-2 shows the monthly wellhead price of natural gas during the previous decade in which the shale gas underneath Tarrant and neighboring counties began to be extracted in significant amounts.[24] As can be seen in the figure, wellhead prices have fluctuated significantly over this time and peaked in 2008 before falling by more than 50% to current levels.

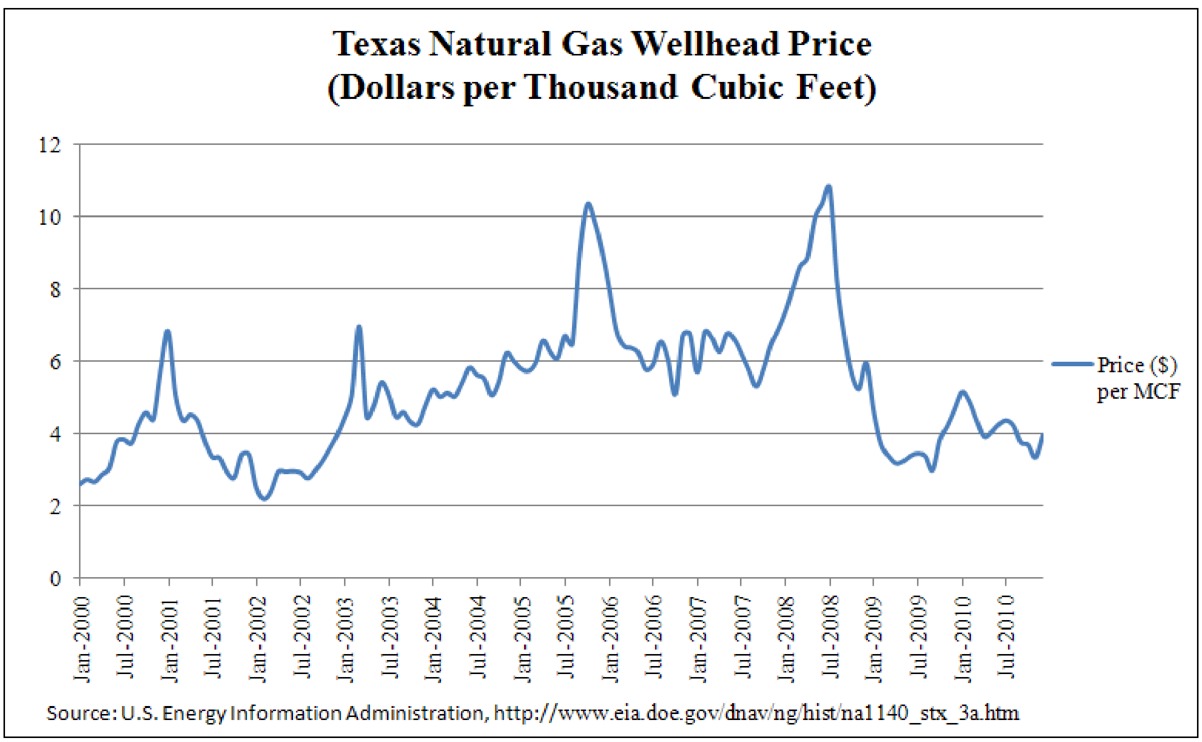
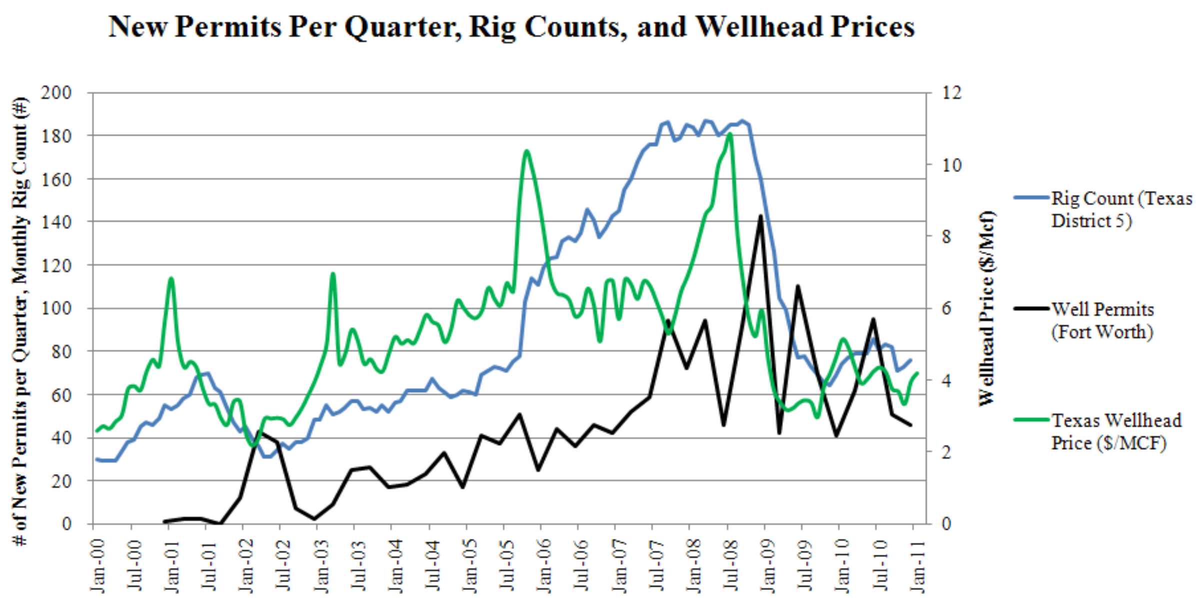


Figure 7.1-2. Texas Natural Gas Wellhead Price (2000–2010)

The U.S. Energy Information Administration, in its *Annual Energy Outlook Overview 2011,*[25] has forecast natural gas prices for the next 25 years. The Administration predicts that the average wellhead price for natural gas will increase by an average of 2.1% per year, to $5.00 per million Btu in 2024 and to $6.26 per million Btu in 2035 (2009 dollars). It should be noted that these estimates fall below the average wellhead natural gas prices between 2005 and 2008, indicating a less desirable economic climate for producers to invest in new drilling and production compared to the prices during the peak in these activities as discussed below.

Due to the depletion of existing wells, new wells must be drilled on a continuing basis to ensure a constant supply of natural gas. However, with current gas prices remaining relatively low, it may not make economic sense for producers to continue to invest in new production. Figure 7.1-3 shows the relationship between wellhead prices and drilling and permit activity over the last 10 years.



Quarterly permit data for Tarrant County from City of Fort Worth and Railroad Commission of Texas, 3/2011 .
Monthly rotary rig count data for Texas District 5 from Baker-Hughes http://investor.shareholder.com/bhi/rig_counts/rc_index.cfm
Monthly Texas natural gas wellhead price data from U.S. Energy Information Administration, http://www.eia.doe.gov/dnav/ng/hist/na1140_stx_3a.htm

Figure 7.1-3. Permits, Rig Counts, and Wellhead Gas Prices in Tarrant County (2000–2010)

As shown in the figure, the number of active drilling rigs in District 5 (which includes Tarrant County) decreased dramatically in response to the drop in natural gas wellhead price beginning in August 2008.[26] Likewise, the number of well pad permits processed by the city of Fort Worth peaked shortly after the peak in natural gas wellhead price in 2008 and have trended downward since then. Prices dropped below $7 per thousand cubic feet in September 2008, below $6 per thousand cubic feet in October 2008. By 2010, both District 5 rig counts and the number of well pad permits issued by the city of Fort Worth were down nearly 60% from their highs in 2008.

7.2 Methodology for Forecasting Natural Gas Production

To estimate future emissions, an estimate of future natural gas production for the target years of 2010 through 2018 must be developed. In 2008, Tristone Capital estimated future production of shale gas in nine shale gas basins in the U.S. and Canada, including the Barnett Shale, for a 10-year period from 2008 to 2018.[27] Figure 7.2-1 shows Tristone's estimates of future production for these eight shale gas plays.

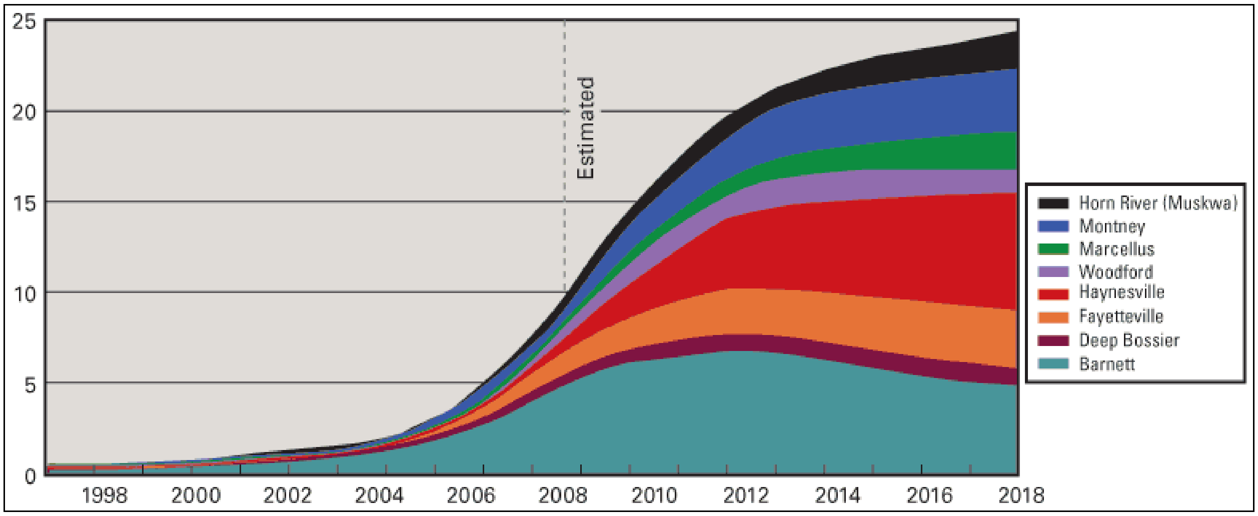


Figure 7.2-1. Projected Production in Eight Shale Plays (BCF) (1998–2018)

Tristone's estimate of future production from the Barnett Shale is reproduced in Figure 7.2-2 as the purple dashed line in the graph. This data is compared with actual production data for the Barnett Shale as taken from the Railroad Commission of Texas (the solid red line). Actual production data for Tarrant County is also presented in the graph (the solid green line), as is projected production data for Tarrant County (the dashed turquoise line). To develop the projected production data for Tarrant County, it was assumed that the percentage growth in production in Tarrant County would increase (or decrease) at the same rate as the Barnett Shale as a whole.

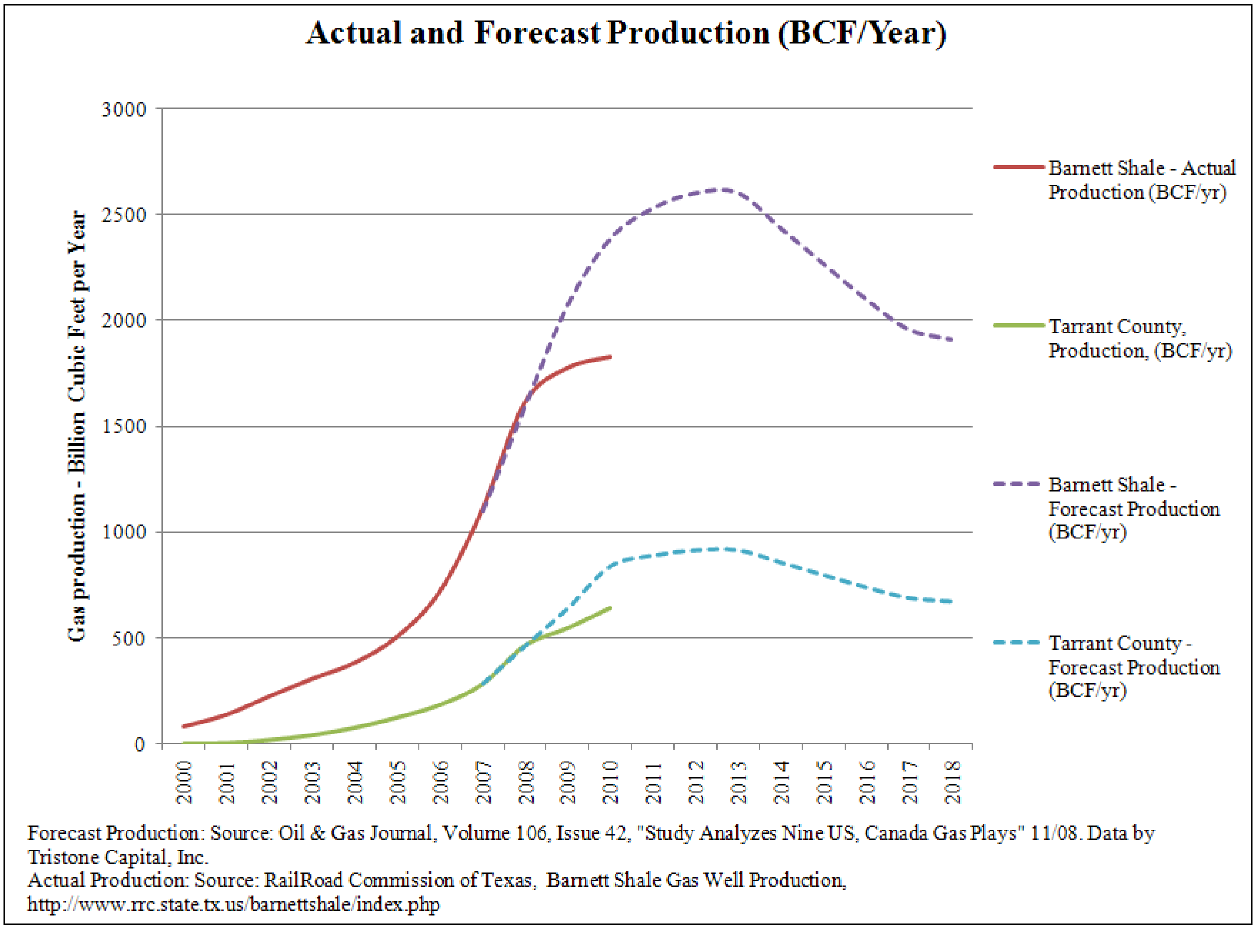


Figure 7.2-2. Barnett Shale and Tarrant County Actual and Projected Natural Gas Production (2000–2018)

As can be seen in the graph, Tristone's estimates closely align with actual production through 2009, then appear to overestimate production. This may be attributed to the dramatic decrease in natural gas prices between 2008 and 2009, resulting in a decrease in drilling activity. Note that this decrease occurred after Tristone had published its projected trends in natural gas production activity. Therefore, ERG believes Tristone's projections provide a conservative estimate of the peak natural gas production in the city of Fort Worth and has based the full build-out emissions inventory on this data, as described below.

7.3 2010 Base Year Emissions Inventory

Under Task 2 of the Fort Worth Natural Gas Air Quality Study, point source testing was conducted at 388 sites, including 375 well pads, eight compressor stations, and the gas processing plant. These data were used to calculate average emission rates for well pads and compressor stations. ERG used these average emission rates to develop a complete 2010 base year emissions inventory from natural gas production in the city of Fort Worth by multiplying the average emissions per well pad (and compressor station) by the total number of well pads (and compressor stations) operating in 2010. As documented in the Final Point Source Test Plan (October 4, 2010) there were 489 active well pads in the city of Fort Worth at the commencement of this study. While data from the city of Fort Worth indicated there were 13 active compressor stations in Fort Worth at the start of this study, there were a total of 30 compressor stations either permitted, under construction, or already in service in 2010. Therefore, for purposes of developing the 2010 base year emissions inventory, it was assumed that there were 30 active compressor stations in Fort Worth in 2010.

Table 7.3-1 shows the average emissions for an individual well pad as determined from the point source testing, as well as the projected total 2010 base year emissions across all 489 well pads in the city of Fort Worth.

Table 7.3-1. 2010 Base Year Well Pad Emissions Inventory

Pollutant	2010 Base Year Average Well Pad Emissions (tons/yr)	2010 Base Year Total Well Pad Emissions (tons/yr)
TOC	33.34	16,302.29
VOCs	0.68	332.71
Total HAPs	0.31	152.36
Methane	32.30	15,795.98
PM	0.03	13.57
NO_x	0.55	266.76
CO	4.77	2,330.62
SO_2	0.002	0.97
Acenaphthene	4.50E-06	2.20E-03
Acenaphthylene	1.87E-05	9.14E-03
Acetaldehyde	2.83E-02	1.38E+01
Acetone	2.52E-03	1.23E+00
Acrolein	2.63E-02	1.29E+01
Anthracene	2.43E-06	1.19E-03
Benzene	9.45E-03	4.62E+00
Benzo (a) anthracene	1.14E-06	5.56E-04
Benzo (a) pyrene	1.92E-08	9.39E-06
Benzo (b) fluoranthene	5.61E-07	2.74E-04
Benzo (e) pyrene	1.40E-06	6.86E-04
Benzo (g,h,i) perylene	1.40E-06	6.84E-04
Benzo (k) fluoranthene	1.44E-08	7.04E-06
Biphenyl	7.17E-04	3.51E-01
Bromomethane	4.98E-06	2.43E-03
Butadiene, 1,3-	2.79E-03	1.37E+00
Butane	8.33E-02	4.07E+01
Butane, n-	1.61E-02	7.85E+00

Table 7.3-1. 2010 Base Year Well Pad Emissions Inventory (Continued)

Pollutant	2010 Base Year Average Well Pad Emissions (tons/yr)	2010 Base Year Total Well Pad Emissions (tons/yr)
Butanone (MEK), 2-	3.08E-05	1.51E-02
Carbon disulfide	5.36E-06	2.62E-03
Carbon tetrachloride	2.10E-04	1.03E-01
Chlorobenzene	1.50E-04	7.34E-02
Chlorodifluoromethane	1.93E-06	9.43E-04
Chloroethane	1.14E-05	5.58E-03
Chloroform	1.59E-04	7.79E-02
Chloromethane	4.29E-06	2.10E-03
Chlorotoluene, 2-	6.64E-06	3.25E-03
Chrysene	2.34E-06	1.15E-03
Cyclohexane	4.81E-03	2.35E+00
Cyclopentane	7.67E-04	3.75E-01
Decane, n-	7.50E-04	3.67E-01
Dichloro-1,1,2,2-tetrafluoroethane, 1,2-	4.57E-06	2.24E-03
Dichlorodifluoromethane	3.83E-06	1.87E-03
Dichloroethane, 1,1-	1.32E-04	6.46E-02
Dichloropropene, 1,3-	1.48E-04	7.24E-02
Dodecane, n-	8.18E-05	4.00E-02
Ethane	3.55E-01	1.74E+02
Ethylbenzene	6.14E-04	3.00E-01
Ethylene dibromide	2.48E-04	1.21E-01
Ethylene dichloride	1.43E-04	6.98E-02
Ethyltoluene, 4-	2.69E-04	1.31E-01
Fluoranthene	3.75E-06	1.84E-03
Fluorene	1.92E-05	9.37E-03
Formaldehyde	1.87E-01	9.13E+01
Heptane	1.35E-02	6.58E+00
Hexachlorobutadiene	4.33E-05	2.12E-02
Hexane	1.66E-02	8.12E+00
Indeno(1,2,3-cd) pyrene	3.36E-08	1.64E-05
Isobutane	1.27E-02	6.20E+00
Isobutyraldehyde	1.48E-03	7.23E-01
Isopentane	2.91E-02	1.42E+01
Isopropylbenzene	9.36E-05	4.58E-02
Isopropyltoluene, 4-	1.15E-04	5.63E-02
Methyl alcohol	1.03E-02	5.06E+00
Methyl Naphthalene, 2-	1.12E-04	5.49E-02
Methyl-2-pentanone, 4- (MIBK)	5.59E-05	2.73E-02
Methylcyclohexane	4.16E-03	2.03E+00
Methylene chloride	2.44E-03	1.19E+00
Naphthalene	3.72E-04	1.82E-01
Nonane, n-	1.07E-02	5.21E+00

Table 7.3-1. 2010 Base Year Well Pad Emissions Inventory (Continued)

Pollutant	2010 Base Year Average Well Pad Emissions (tons/yr)	2010 Base Year Total Well Pad Emissions (tons/yr)
Octane, n-	1.47E-02	7.18E+00
Pentane, n-	2.99E-02	1.46E+01
Perylene	1.68E-08	8.22E-06
Phenanthrene	3.52E-05	1.72E-02
Phenol	1.42E-04	6.96E-02
Polycyclic Aromatic Hydrocarbons (PAH)	4.77E-04	2.33E-01
Propane	1.42E-01	6.93E+01
Propylbenzene, n-	1.42E-04	6.94E-02
Propylene	1.42E-05	6.94E-03
Propylene dichloride	1.51E-04	7.37E-02
Pyrene	4.60E-06	2.25E-03
sec-Butylbenzene	6.80E-05	3.32E-02
Styrene	1.90E-04	9.31E-02
Tetrachloroethane, 1,1,2,2-	2.24E-04	1.10E-01
Tetrachloroethene	1.37E-04	6.69E-02
Toluene	1.35E-02	6.62E+00
Trichlorobenzene, 1,2,3-	6.96E-05	3.41E-02
Trichlorobenzene, 1,2,4-	5.18E-05	2.53E-02
Trichloroethane, 1,1,2-	1.78E-04	8.71E-02
Trichlorofluoromethane	5.63E-06	2.75E-03
Trimethylbenzene, 1,2,3-	1.20E-04	5.85E-02
Trimethylbenzene, 1,2,4-	9.67E-04	4.73E-01
Trimethylbenzene, 1,3,5-	6.37E-04	3.12E-01
Trimethylpentane, 2,2,4-	2.90E-03	1.42E+00
Undecane, n-	1.68E-04	8.20E-02
Vinyl acetate	2.51E-05	1.23E-02
Vinyl bromide	6.03E-06	2.95E-03
Vinyl chloride	8.64E-05	4.23E-02
Xylene, o	5.58E-04	2.73E-01
Xylenes (isomers)	9.06E-04	4.43E-01
Xylenes, m-, p-	5.92E-03	2.90E+00

Table 7.3-2 shows the average emissions for an individual compressor station as determined from the point source testing, as well as the projected total 2010 base year emissions across all 30 compressor stations in the city of Fort Worth.

Table 7.3-2. 2010 Base Year Compressor Station Emissions Inventory

Pollutant	2010 Base Year Average Compressor Station Emissions (tons/yr)	2010 Base Year Total Compressor Station Emissions (tons/yr)
TOC	99.61	2,988.29
VOCs	17.20	515.86
Total HAPs	10.17	304.95
Methane	69.37	2,080.99
PM	0.36	10.94
NO_x	19.63	588.88
CO	151.47	4,544.19
SO_2	0.07	2.17
Acenaphthene	1.65E-04	4.96E-03
Acenaphthylene	6.87E-04	2.06E-02
Acetaldehyde	1.04E+00	3.12E+01
Acetone	6.63E-04	1.99E-02
Acrolein	9.67E-01	2.90E+01
Anthracene	8.92E-05	2.68E-03
Benzene	2.44E-01	7.31E+00
Benzo (a) anthracene	4.18E-05	1.25E-03
Benzo (a) pyrene	7.06E-07	2.12E-05
Benzo (b) fluoranthene	2.06E-05	6.19E-04
Benzo (e) pyrene	5.16E-05	1.55E-03
Benzo (g,h,i) perylene	5.14E-05	1.54E-03
Benzo (k) fluoranthene	5.29E-07	1.59E-05
Biphenyl	2.63E-02	7.90E-01
Bromomethane	7.78E-06	2.33E-04
Butadiene, 1,3-	1.02E-01	3.06E+00
Butane	2.65E-02	7.94E-01
Butane, n-	5.90E-01	1.77E+01
Butanone (MEK), 2-	2.76E-05	8.28E-04
Carbon disulfide	1.44E-06	4.32E-05
Carbon tetrachloride	7.55E-03	2.27E-01
Chlorobenzene	5.52E-03	1.66E-01
Chlorodifluoromethane	3.02E-06	9.05E-05
Chloroethane	2.40E-04	7.21E-03
Chloroform	5.85E-03	1.76E-01
Chloromethane	4.48E-06	1.34E-04
Chlorotoluene, 2-	1.04E-05	3.12E-04
Chrysene	8.61E-05	2.58E-03
Cyclohexane	3.94E-02	1.18E+00
Cyclopentane	2.82E-02	8.46E-01
Decane, n-	9.74E-05	2.92E-03
Dichloro-1,1,2,2-tetrafluoroethane, 1,2-	7.14E-06	2.14E-04
Dichlorodifluoromethane	5.99E-06	1.80E-04
Dichloroethane, 1,1-	4.86E-03	1.46E-01
Dichloropropene, 1,3-	5.44E-03	1.63E-01

Table 7.3-2. 2010 Base Year Compressor Station Emissions Inventory (Continued)

Pollutant	2010 Base Year Average Compressor Station Emissions (tons/yr)	2010 Base Year Total Compressor Station Emissions (tons/yr)
Dodecane, n-	4.57E-05	1.37E-03
Ethane	1.30E+01	3.91E+02
Ethylbenzene	1.35E-02	4.05E-01
Ethylene dibromide	9.12E-03	2.74E-01
Ethylene dichloride	5.24E-03	1.57E-01
Ethyltoluene, 4-	7.55E-03	2.27E-01
Fluoranthene	1.38E-04	4.14E-03
Fluorene	7.05E-04	2.11E-02
Formaldehyde	6.86E+00	2.06E+02
Heptane	2.76E-04	8.27E-03
Hexachlorobutadiene	4.91E-05	1.47E-03
Hexane	1.39E-01	4.16E+00
Indeno(1,2,3-cd) pyrene	1.23E-06	3.70E-05
Isobutane	4.66E-01	1.40E+01
Isobutyraldehyde	5.43E-02	1.63E+00
Isopentane	6.77E-03	2.03E-01
Isopropylbenzene	1.29E-04	3.86E-03
Isopropyltoluene, 4-	2.86E-04	8.59E-03
Methyl alcohol	3.80E-01	1.14E+01
Methyl Naphthalene, 2-	4.13E-03	1.24E-01
Methyl-2-pentanone, 4- (MIBK)	1.33E-04	3.98E-03
Methylcyclohexane	1.53E-01	4.59E+00
Methylene chloride	1.83E-02	5.49E-01
Naphthalene	1.21E-02	3.64E-01
Nonane, n-	1.38E-02	4.15E-01
Octane, n-	4.37E-02	1.31E+00
Pentane, n-	3.26E-01	9.78E+00
Perylene	6.18E-07	1.85E-05
Phenanthrene	1.29E-03	3.88E-02
Phenol	5.23E-03	1.57E-01
Polycyclic Aromatic Hydrocarbons (PAH)	1.75E-02	5.26E-01
Propane	5.21E+00	1.56E+02
Propylbenzene, n-	2.84E-03	8.51E-02
Propylene	1.59E-05	4.78E-04
Propylene dichloride	5.54E-03	1.66E-01
Pyrene	1.69E-04	5.07E-03
sec-Butylbenzene	3.57E-04	1.07E-02
Styrene	6.81E-03	2.04E-01
Tetrachloroethane, 1,1,2,2-	8.24E-03	2.47E-01
Tetrachloroethene	3.62E-05	1.09E-03
Toluene	1.21E-01	3.64E+00
Trichlorobenzene, 1,2,3-	8.35E-05	2.51E-03

Table 7.3-2. 2010 Base Year Compressor Station Emissions Inventory (Continued)

Pollutant	2010 Base Year Average Compressor Station Emissions (tons/yr)	2010 Base Year Total Compressor Station Emissions (tons/yr)
Trichlorobenzene, 1,2,4-	5.63E-05	1.69E-03
Trichloroethane, 1,1,2-	6.55E-03	1.96E-01
Trichlorofluoromethane	8.81E-06	2.64E-04
Trimethylbenzene, 1,2,3-	4.40E-03	1.32E-01
Trimethylbenzene, 1,2,4-	4.66E-02	1.40E+00
Trimethylbenzene, 1,3,5-	1.25E-02	3.75E-01
Trimethylpentane, 2,2,4-	1.05E-01	3.15E+00
Undecane, n-	4.54E-05	1.36E-03
Vinyl acetate	7.23E-06	2.17E-04
Vinyl bromide	9.43E-06	2.83E-04
Vinyl chloride	3.07E-03	9.22E-02
Xylene, o	1.89E-04	5.68E-03
Xylenes (isomers)	3.33E-02	9.99E-01
Xylenes, m-, p-	3.30E-04	9.89E-03

Table 7.3-3 shows the cumulative 2010 base year emissions from all compressor stations, well pads, and the gas processing plant in the city of Fort Worth, combined.

Table 7.3-3. 2010 Base Year Cumulative Emissions Inventory

Pollutant	2010 Compressor Station Emissions (tons/yr)	2010 Well Pad Emissions (tons/yr)	2010 Processing Plant Emissions (tons/yr)	2010 Total Emissions (tons/yr)
TOC	2,988.29	16,302.29	1,293.26	20,583.84
VOCs	515.86	332.71	79.93	928.51
Total HAPs	304.95	152.36	47.32	504.63
Methane	2,080.99	15,795.98	1,152.60	19,029.56
PM	10.94	13.57	1.00	25.51
NO_x	588.88	266.76	87.74	943.38
CO	4,544.19	2,330.62	1,038.90	7,913.71
SO_2	2.17	0.97	0.34	3.48
Acenaphthene	4.96E-03	2.20E-03	7.69E-04	7.93E-03
Acenaphthylene	2.06E-02	9.14E-03	3.20E-03	3.30E-02
Acetaldehyde	3.12E+01	1.38E+01	4.84E+00	4.98E+01
Acetone	1.99E-02	1.23E+00	2.35E-04	1.25E+00
Acrolein	2.90E+01	1.29E+01	4.50E+00	4.64E+01
Anthracene	2.68E-03	1.19E-03	4.15E-04	4.28E-03
Benzene	7.31E+00	4.62E+00	1.14E+00	1.31E+01
Benzo (a) anthracene	1.25E-03	5.56E-04	1.94E-04	2.00E-03
Benzo (a) pyrene	2.12E-05	9.39E-06	3.29E-06	3.39E-05
Benzo (b) fluoranthene	6.19E-04	2.74E-04	9.60E-05	9.89E-04
Benzo (e) pyrene	1.55E-03	6.86E-04	2.40E-04	2.47E-03
Benzo (g,h,i) perylene	1.54E-03	6.84E-04	2.39E-04	2.47E-03
Benzo (k) fluoranthene	1.59E-05	7.04E-06	2.46E-06	2.54E-05
Biphenyl	7.90E-01	3.51E-01	1.23E-01	1.26E+00
Bromomethane	2.33E-04	2.43E-03	9.34E-07	2.67E-03
Butadiene, 1,3-	3.06E+00	1.37E+00	4.74E-01	4.90E+00
Butane	7.94E-01	4.07E+01	2.15E-01	4.17E+01
Butane, n-	1.77E+01	7.85E+00	2.75E+00	2.83E+01
Butanone (MEK), 2-	8.28E-04	1.51E-02	2.58E-05	1.59E-02
Carbon disulfide	4.32E-05	2.62E-03	7.25E-06	2.67E-03
Carbon tetrachloride	2.27E-01	1.03E-01	3.51E-02	3.64E-01
Chlorobenzene	1.66E-01	7.34E-02	2.57E-02	2.65E-01
Chlorodifluoromethane	9.05E-05	9.43E-04	3.62E-07	1.03E-03
Chloroethane	7.21E-03	5.58E-03	1.08E-03	1.39E-02
Chloroform	1.76E-01	7.79E-02	2.72E-02	2.81E-01
Chloromethane	1.34E-04	2.10E-03	1.07E-04	2.34E-03

Table 7.3-3. 2010 Base Year Cumulative Emissions Inventory (Continued)

Pollutant	2010 Compressor Station Emissions (tons/yr)	2010 Well Pad Emissions (tons/yr)	2010 Processing Plant Emissions (tons/yr)	2010 Total Emissions (tons/yr)
Chlorotoluene, 2-	3.12E-04	3.25E-03	1.25E-06	3.56E-03
Chrysene	2.58E-03	1.15E-03	4.01E-04	4.13E-03
Cyclohexane	1.18E+00	2.35E+00	1.91E-01	3.72E+00
Cyclopentane	8.46E-01	3.75E-01	1.31E-01	1.35E+00
Decane, n-	2.92E-03	3.67E-01	5.97E-05	3.70E-01
Dichloro-1,1,2,2-tetrafluoroethane, 1,2-	2.14E-04	2.24E-03	8.57E-07	2.45E-03
Dichlorodifluoromethane	1.80E-04	1.87E-03	7.19E-07	2.05E-03
Dichloroethane, 1,1-	1.46E-01	6.46E-02	2.26E-02	2.33E-01
Dichloropropene, 1,3-	1.63E-01	7.24E-02	2.53E-02	2.61E-01
Dodecane, n-	1.37E-03	4.00E-02	4.25E-05	4.14E-02
Ethane	3.91E+02	1.74E+02	6.07E+01	6.26E+02
Ethylbenzene	4.05E-01	3.00E-01	6.27E-02	7.68E-01
Ethylene dibromide	2.74E-01	1.21E-01	4.25E-02	4.37E-01
Ethylene dichloride	1.57E-01	6.98E-02	2.44E-02	2.51E-01
Ethyltoluene, 4-	2.27E-01	1.31E-01	8.90E-05	3.58E-01
Fluoranthene	4.14E-03	1.84E-03	6.42E-04	6.62E-03
Fluorene	2.11E-02	9.37E-03	3.28E-03	3.38E-02
Formaldehyde	2.06E+02	9.13E+01	3.19E+01	3.29E+02
Heptane	8.27E-03	6.58E+00	2.75E-03	6.59E+00
Hexachlorobutadiene	1.47E-03	2.12E-02	2.60E-05	2.27E-02
Hexane	4.16E+00	8.12E+00	6.52E-01	1.29E+01
Indeno(1,2,3-cd) pyrene	3.70E-05	1.64E-05	5.74E-06	5.92E-05
Isobutane	1.40E+01	6.20E+00	2.17E+00	2.23E+01
Isobutyraldehyde	1.63E+00	7.23E-01	2.53E-01	2.60E+00
Isopentane	2.03E-01	1.42E+01	4.54E-02	1.45E+01
Isopropylbenzene	3.86E-03	4.58E-02	5.43E-05	4.97E-02
Isopropyltoluene, 4-	8.59E-03	5.63E-02	5.43E-05	6.50E-02
Methyl alcohol	1.14E+01	5.06E+00	1.77E+00	1.82E+01
Methyl Naphthalene, 2-	1.24E-01	5.49E-02	1.92E-02	1.98E-01
Methyl-2-pentanone, 4- (MIBK)	3.98E-03	2.73E-02	1.65E-05	3.13E-02
Methylcyclohexane	4.59E+00	2.03E+00	7.11E-01	7.33E+00
Methylene chloride	5.49E-01	1.19E+00	8.53E-02	1.83E+00
Naphthalene	3.64E-01	1.82E-01	5.62E-02	6.02E-01
Nonane, n-	4.15E-01	5.21E+00	6.41E-02	5.69E+00
Octane, n-	1.31E+00	7.18E+00	2.04E-01	8.69E+00
Pentane, n-	9.78E+00	1.46E+01	1.54E+00	2.60E+01
Perylene	1.85E-05	8.22E-06	2.87E-06	2.96E-05
Phenanthrene	3.88E-02	1.72E-02	6.01E-03	6.20E-02
Phenol	1.57E-01	6.96E-02	2.43E-02	2.51E-01

Table 7.3-3. 2010 Base Year Cumulative Emissions Inventory (Continued)

Pollutant	2010 Compressor Station Emissions (tons/yr)	2010 Well Pad Emissions (tons/yr)	2010 Processing Plant Emissions (tons/yr)	2010 Total Emissions (tons/yr)
Polycyclic Aromatic Hydrocarbons (PAH)	5.26E-01	2.33E-01	8.15E-02	8.40E-01
Propane	1.56E+02	6.93E+01	2.42E+01	2.50E+02
Propylbenzene, n-	8.51E-02	6.94E-02	6.59E-05	1.55E-01
Propylene	4.78E-04	6.94E-03	6.06E-06	7.43E-03
Propylene dichloride	1.66E-01	7.37E-02	2.58E-02	2.66E-01
Pyrene	5.07E-03	2.25E-03	7.87E-04	8.11E-03
sec-Butylbenzene	1.07E-02	3.32E-02	3.95E-05	4.40E-02
Styrene	2.04E-01	9.31E-02	3.17E-02	3.29E-01
Tetrachloroethane, 1,1,2,2-	2.47E-01	1.10E-01	3.83E-02	3.95E-01
Tetrachloroethene	1.09E-03	6.69E-02	1.83E-04	6.81E-02
Toluene	3.64E+00	6.62E+00	5.63E-01	1.08E+01
Trichlorobenzene, 1,2,3-	2.51E-03	3.41E-02	3.74E-05	3.66E-02
Trichlorobenzene, 1,2,4-	1.69E-03	2.53E-02	3.39E-05	2.70E-02
Trichloroethane, 1,1,2-	1.96E-01	8.71E-02	3.05E-02	3.14E-01
Trichlorofluoromethane	2.64E-04	2.75E-03	1.06E-06	3.02E-03
Trimethylbenzene, 1,2,3-	1.32E-01	5.85E-02	2.05E-02	2.11E-01
Trimethylbenzene, 1,2,4-	1.40E+00	4.73E-01	6.43E-02	1.94E+00
Trimethylbenzene, 1,3,5-	3.75E-01	3.12E-01	1.97E-02	7.07E-01
Trimethylpentane, 2,2,4-	3.15E+00	1.42E+00	4.89E-01	5.06E+00
Undecane, n-	1.36E-03	8.20E-02	7.17E-05	8.34E-02
Vinyl acetate	2.17E-04	1.23E-02	3.64E-05	1.25E-02
Vinyl bromide	2.83E-04	2.95E-03	1.13E-06	3.23E-03
Vinyl chloride	9.22E-02	4.23E-02	1.43E-02	1.49E-01
Xylene, o	5.68E-03	2.73E-01	2.87E-04	2.79E-01
Xylenes (isomers)	9.99E-01	4.43E-01	1.55E-01	1.60E+00
Xylenes, m-, p-	9.89E-03	2.90E+00	1.01E-03	2.91E+00

7.4 2010 through 2018 Projected Emissions Inventories

Using the projected production data shown in Figure 7.2-2, growth factors (relative to the 2010 base year) were developed for years 2010 through 2018. Table 7.4-1 shows these factors, and indicates that projected peak production will occur in 2012 and 2013.

Table 7.4-1. Growth Factors for Years 2010–2018

Year	Growth Factor
2010	1.00
2011	1.06
2012	1.09
2013	1.09
2014	1.02
2015	0.95
2016	0.88
2017	0.82
2018	0.80

The growth factors shown in Table 7.4-1 were then used to project the 2010 base year emissions inventory to the years 2011 through 2018. Table 7.4-2 shows the resultant emissions inventory for each pollutant for each year.

Table 7.4-2. Projected Emissions for Years 2010–2018

Pollutant	2010 (tons/yr)	2011 (tons/yr)	2012 (tons/yr)	2013 (tons/yr)	2014 (tons/yr)	2015 (tons/yr)	2016 (tons/yr)	2017 (tons/yr)	2018 (tons/yr)
TOC	20,583.84	21,818.87	22,436.38	22,436.38	20,995.51	19,554.65	18,113.78	16,878.75	16,467.07
VOCs	928.51	984.22	1,012.07	1,012.07	947.08	882.08	817.09	761.38	742.80
Total HAPs	504.63	534.91	550.04	550.04	514.72	479.40	444.07	413.79	403.70
Methane	19,029.56	20,171.33	20,742.22	20,742.22	19,410.15	18,078.08	16,746.01	15,604.24	15,223.65
PM	25.51	27.04	27.81	27.81	26.02	24.24	22.45	20.92	20.41
NO_x	943.38	999.99	1,028.29	1,028.29	962.25	896.21	830.18	773.57	754.71
CO	7,913.71	8,388.53	8,625.94	8,625.94	8,071.98	7,518.02	6,964.06	6,489.24	6,330.97
SO_2	3.48	3.68	3.79	3.79	3.55	3.30	3.06	2.85	2.78
Acenaphthene	7.93E-03	8.40E-03	8.64E-03	8.64E-03	8.08E-03	7.53E-03	6.98E-03	6.50E-03	6.34E-03
Acenaphthylene	3.30E-02	3.49E-02	3.59E-02	3.59E-02	3.36E-02	3.13E-02	2.90E-02	2.70E-02	2.64E-02
Acetaldehyde	4.98E+01	5.28E+01	5.43E+01	5.43E+01	5.08E+01	4.73E+01	4.38E+01	4.09E+01	3.99E+01
Acetone	1.25E+00	1.33E+00	1.37E+00	1.37E+00	1.28E+00	1.19E+00	1.10E+00	1.03E+00	1.00E+00
Acrolein	4.64E+01	4.91E+01	5.05E+01	5.05E+01	4.73E+01	4.40E+01	4.08E+01	3.80E+01	3.71E+01
Anthracene	4.28E-03	4.54E-03	4.66E-03	4.66E-03	4.36E-03	4.07E-03	3.77E-03	3.51E-03	3.42E-03
Benzene	1.31E+01	1.38E+01	1.42E+01	1.42E+01	1.33E+01	1.24E+01	1.15E+01	1.07E+01	1.05E+01
Benzo (a) anthracene	2.00E-03	2.12E-03	2.18E-03	2.18E-03	2.04E-03	1.90E-03	1.76E-03	1.64E-03	1.60E-03
Benzo (a) pyrene	3.39E-05	3.59E-05	3.69E-05	3.69E-05	3.45E-05	3.22E-05	2.98E-05	2.78E-05	2.71E-05
Benzo (b) fluoranthene	9.89E-04	1.05E-03	1.08E-03	1.08E-03	1.01E-03	9.40E-04	8.71E-04	8.11E-04	7.91E-04
Benzo (e) pyrene	2.47E-03	2.62E-03	2.70E-03	2.70E-03	2.52E-03	2.35E-03	2.18E-03	2.03E-03	1.98E-03
Benzo (g,h,i) perylene	2.47E-03	2.62E-03	2.69E-03	2.69E-03	2.52E-03	2.34E-03	2.17E-03	2.02E-03	1.97E-03
Benzo (k) fluoranthene	2.54E-05	2.69E-05	2.77E-05	2.77E-05	2.59E-05	2.41E-05	2.23E-05	2.08E-05	2.03E-05
Biphenyl	1.26E+00	1.34E+00	1.38E+00	1.38E+00	1.29E+00	1.20E+00	1.11E+00	1.04E+00	1.01E+00
Bromomethane	2.67E-03	2.83E-03	2.91E-03	2.91E-03	2.72E-03	2.53E-03	2.35E-03	2.19E-03	2.13E-03
Butadiene, 1,3-	4.90E+00	5.19E+00	5.34E+00	5.34E+00	5.00E+00	4.65E+00	4.31E+00	4.02E+00	3.92E+00
Butane	4.17E+01	4.42E+01	4.55E+01	4.55E+01	4.26E+01	3.97E+01	3.67E+01	3.42E+01	3.34E+01

Table 7.4-2. Projected Emissions for Years 2010–2018 (Continued)

Pollutant	2010 (tons/yr)	2011 (tons/yr)	2012 (tons/yr)	2013 (tons/yr)	2014 (tons/yr)	2015 (tons/yr)	2016 (tons/yr)	2017 (tons/yr)	2018 (tons/yr)
Butane, n-	2.83E+01	3.00E+01	3.09E+01	3.09E+01	2.89E+01	2.69E+01	2.49E+01	2.32E+01	2.26E+01
Butanone (Methyl Ethyl Ketone), 2-	1.59E-02	1.69E-02	1.74E-02	1.74E-02	1.63E-02	1.51E-02	1.40E-02	1.31E-02	1.27E-02
Carbon disulfide	2.67E-03	2.83E-03	2.91E-03	2.91E-03	2.73E-03	2.54E-03	2.35E-03	2.19E-03	2.14E-03
Carbon tetrachloride	3.64E-01	3.86E-01	3.97E-01	3.97E-01	3.72E-01	3.46E-01	3.21E-01	2.99E-01	2.91E-01
Chlorobenzene	2.65E-01	2.80E-01	2.88E-01	2.88E-01	2.70E-01	2.51E-01	2.33E-01	2.17E-01	2.12E-01
Chlorodifluoromethane	1.03E-03	1.10E-03	1.13E-03	1.13E-03	1.05E-03	9.82E-04	9.10E-04	8.48E-04	8.27E-04
Chloroethane	1.39E-02	1.47E-02	1.51E-02	1.51E-02	1.41E-02	1.32E-02	1.22E-02	1.14E-02	1.11E-02
Chloroform	2.81E-01	2.98E-01	3.06E-01	3.06E-01	2.86E-01	2.67E-01	2.47E-01	2.30E-01	2.25E-01
Chloromethane	2.34E-03	2.48E-03	2.55E-03	2.55E-03	2.39E-03	2.22E-03	2.06E-03	1.92E-03	1.87E-03
Chlorotoluene, 2-	3.56E-03	3.77E-03	3.88E-03	3.88E-03	3.63E-03	3.38E-03	3.13E-03	2.92E-03	2.85E-03
Chrysene	4.13E-03	4.38E-03	4.50E-03	4.50E-03	4.21E-03	3.92E-03	3.63E-03	3.39E-03	3.30E-03
Cyclohexane	3.72E+00	3.95E+00	4.06E+00	4.06E+00	3.80E+00	3.54E+00	3.28E+00	3.05E+00	2.98E+00
Cyclopentane	1.35E+00	1.43E+00	1.47E+00	1.47E+00	1.38E+00	1.29E+00	1.19E+00	1.11E+00	1.08E+00
Decane, n-	3.70E-01	3.92E-01	4.03E-01	4.03E-01	3.77E-01	3.51E-01	3.25E-01	3.03E-01	2.96E-01
Dichloro-1,1,2,2-tetrafluoroethane, 1,2-	2.45E-03	2.60E-03	2.67E-03	2.67E-03	2.50E-03	2.33E-03	2.16E-03	2.01E-03	1.96E-03
Dichlorodifluoromethane	2.05E-03	2.18E-03	2.24E-03	2.24E-03	2.09E-03	1.95E-03	1.81E-03	1.68E-03	1.64E-03
Dichloroethane, 1,1-	2.33E-01	2.47E-01	2.54E-01	2.54E-01	2.38E-01	2.21E-01	2.05E-01	1.91E-01	1.86E-01
Dichloropropene, 1,3-	2.61E-01	2.77E-01	2.85E-01	2.85E-01	2.66E-01	2.48E-01	2.30E-01	2.14E-01	2.09E-01
Dodecane, n-	4.14E-02	4.39E-02	4.52E-02	4.52E-02	4.23E-02	3.94E-02	3.65E-02	3.40E-02	3.31E-02
Ethane	6.26E+02	6.63E+02	6.82E+02	6.82E+02	6.38E+02	5.94E+02	5.51E+02	5.13E+02	5.01E+02
Ethylbenzene	7.68E-01	8.14E-01	8.37E-01	8.37E-01	7.83E-01	7.29E-01	6.75E-01	6.29E-01	6.14E-01
Ethylene dibromide	4.37E-01	4.64E-01	4.77E-01	4.77E-01	4.46E-01	4.16E-01	3.85E-01	3.59E-01	3.50E-01
Ethylene dichloride	2.51E-01	2.67E-01	2.74E-01	2.74E-01	2.57E-01	2.39E-01	2.21E-01	2.06E-01	2.01E-01
Ethyltoluene, 4-	3.58E-01	3.80E-01	3.90E-01	3.90E-01	3.65E-01	3.40E-01	3.15E-01	2.94E-01	2.86E-01

Table 7.4-2. Projected Emissions for Years 2010–2018 (Continued)

Pollutant	2010 (tons/yr)	2011 (tons/yr)	2012 (tons/yr)	2013 (tons/yr)	2014 (tons/yr)	2015 (tons/yr)	2016 (tons/yr)	2017 (tons/yr)	2018 (tons/yr)
Fluoranthene	6.62E-03	7.01E-03	7.21E-03	7.21E-03	6.75E-03	6.28E-03	5.82E-03	5.42E-03	5.29E-03
Fluorene	3.38E-02	3.58E-02	3.68E-02	3.68E-02	3.45E-02	3.21E-02	2.97E-02	2.77E-02	2.70E-02
Formaldehyde	3.29E+02	3.49E+02	3.59E+02	3.59E+02	3.36E+02	3.13E+02	2.89E+02	2.70E+02	2.63E+02
Heptane	6.59E+00	6.99E+00	7.18E+00	7.18E+00	6.72E+00	6.26E+00	5.80E+00	5.41E+00	5.27E+00
Hexachlorobutadiene	2.27E-02	2.41E-02	2.47E-02	2.47E-02	2.31E-02	2.16E-02	2.00E-02	1.86E-02	1.82E-02
Hexane	1.29E+01	1.37E+01	1.41E+01	1.41E+01	1.32E+01	1.23E+01	1.14E+01	1.06E+01	1.03E+01
Indeno(1,2,3-cd) pyrene	5.92E-05	6.27E-05	6.45E-05	6.45E-05	6.04E-05	5.62E-05	5.21E-05	4.85E-05	4.73E-05
Isobutane	2.23E+01	2.37E+01	2.44E+01	2.44E+01	2.28E+01	2.12E+01	1.97E+01	1.83E+01	1.79E+01
Isobutyraldehyde	2.60E+00	2.76E+00	2.84E+00	2.84E+00	2.66E+00	2.47E+00	2.29E+00	2.14E+00	2.08E+00
Isopentane	1.45E+01	1.54E+01	1.58E+01	1.58E+01	1.48E+01	1.38E+01	1.28E+01	1.19E+01	1.16E+01
Isopropylbenzene	4.97E-02	5.26E-02	5.41E-02	5.41E-02	5.07E-02	4.72E-02	4.37E-02	4.07E-02	3.97E-02
Isopropyltoluene, 4-	6.50E-02	6.89E-02	7.08E-02	7.08E-02	6.63E-02	6.17E-02	5.72E-02	5.33E-02	5.20E-02
Methyl alcohol	1.82E+01	1.93E+01	1.99E+01	1.99E+01	1.86E+01	1.73E+01	1.60E+01	1.50E+01	1.46E+01
Methyl Naphthalene, 2-	1.98E-01	2.10E-01	2.16E-01	2.16E-01	2.02E-01	1.88E-01	1.74E-01	1.62E-01	1.58E-01
Methyl-2-pentanone, 4- (Methyl Isobutyl Ketone)	3.13E-02	3.32E-02	3.41E-02	3.41E-02	3.19E-02	2.97E-02	2.76E-02	2.57E-02	2.51E-02
Methylcyclohexane	7.33E+00	7.77E+00	7.99E+00	7.99E+00	7.48E+00	6.96E+00	6.45E+00	6.01E+00	5.86E+00
Methylene chloride	1.83E+00	1.94E+00	1.99E+00	1.99E+00	1.86E+00	1.74E+00	1.61E+00	1.50E+00	1.46E+00
Naphthalene	6.02E-01	6.38E-01	6.56E-01	6.56E-01	6.14E-01	5.72E-01	5.30E-01	4.94E-01	4.82E-01
Nonane, n-	5.69E+00	6.03E+00	6.20E+00	6.20E+00	5.80E+00	5.40E+00	5.01E+00	4.66E+00	4.55E+00
Octane, n-	8.69E+00	9.22E+00	9.48E+00	9.48E+00	8.87E+00	8.26E+00	7.65E+00	7.13E+00	6.96E+00
Pentane, n-	2.60E+01	2.75E+01	2.83E+01	2.83E+01	2.65E+01	2.47E+01	2.28E+01	2.13E+01	2.08E+01
Perylene	2.96E-05	3.14E-05	3.23E-05	3.23E-05	3.02E-05	2.81E-05	2.61E-05	2.43E-05	2.37E-05
Phenanthrene	6.20E-02	6.57E-02	6.76E-02	6.76E-02	6.32E-02	5.89E-02	5.45E-02	5.08E-02	4.96E-02
Phenol	2.51E-01	2.66E-01	2.73E-01	2.73E-01	2.56E-01	2.38E-01	2.21E-01	2.06E-01	2.01E-01

Table 7.4-2. Projected Emissions for Years 2010–2018 (Continued)

Pollutant	2010 (tons/yr)	2011 (tons/yr)	2012 (tons/yr)	2013 (tons/yr)	2014 (tons/yr)	2015 (tons/yr)	2016 (tons/yr)	2017 (tons/yr)	2018 (tons/yr)
Polycyclic Aromatic Hydrocarbons (PAH)	8.40E-01	8.91E-01	9.16E-01	9.16E-01	8.57E-01	7.98E-01	7.39E-01	6.89E-01	6.72E-01
Propane	2.50E+02	2.65E+02	2.72E+02	2.72E+02	2.55E+02	2.37E+02	2.20E+02	2.05E+02	2.00E+02
Propylbenzene, n-	1.55E-01	1.64E-01	1.68E-01	1.68E-01	1.58E-01	1.47E-01	1.36E-01	1.27E-01	1.24E-01
Propylene	7.43E-03	7.87E-03	8.09E-03	8.09E-03	7.57E-03	7.05E-03	6.53E-03	6.09E-03	5.94E-03
Propylene dichloride	2.66E-01	2.82E-01	2.90E-01	2.90E-01	2.71E-01	2.53E-01	2.34E-01	2.18E-01	2.13E-01
Pyrene	8.11E-03	8.59E-03	8.83E-03	8.83E-03	8.27E-03	7.70E-03	7.13E-03	6.65E-03	6.48E-03
sec-Butylbenzene	4.40E-02	4.66E-02	4.80E-02	4.80E-02	4.49E-02	4.18E-02	3.87E-02	3.61E-02	3.52E-02
Styrene	3.29E-01	3.49E-01	3.59E-01	3.59E-01	3.36E-01	3.13E-01	2.90E-01	2.70E-01	2.63E-01
Tetrachloroethane, 1,1,2,2-	3.95E-01	4.19E-01	4.31E-01	4.31E-01	4.03E-01	3.75E-01	3.48E-01	3.24E-01	3.16E-01
Tetrachloroethene	6.81E-02	7.22E-02	7.43E-02	7.43E-02	6.95E-02	6.47E-02	6.00E-02	5.59E-02	5.45E-02
Toluene	1.08E+01	1.15E+01	1.18E+01	1.18E+01	1.10E+01	1.03E+01	9.52E+00	8.87E+00	8.66E+00
Trichlorobenzene, 1,2,3-	3.66E-02	3.88E-02	3.99E-02	3.99E-02	3.73E-02	3.48E-02	3.22E-02	3.00E-02	2.93E-02
Trichlorobenzene, 1,2,4-	2.70E-02	2.87E-02	2.95E-02	2.95E-02	2.76E-02	2.57E-02	2.38E-02	2.22E-02	2.16E-02
Trichloroethane, 1,1,2-	3.14E-01	3.33E-01	3.42E-01	3.42E-01	3.20E-01	2.98E-01	2.76E-01	2.58E-01	2.51E-01
Trichlorofluoromethane	3.02E-03	3.20E-03	3.29E-03	3.29E-03	3.08E-03	2.87E-03	2.65E-03	2.47E-03	2.41E-03
Trimethylbenzene, 1,2,3-	2.11E-01	2.24E-01	2.30E-01	2.30E-01	2.15E-01	2.00E-01	1.86E-01	1.73E-01	1.69E-01
Trimethylbenzene, 1,2,4-	1.94E+00	2.05E+00	2.11E+00	2.11E+00	1.98E+00	1.84E+00	1.70E+00	1.59E+00	1.55E+00
Trimethylbenzene, 1,3,5-	7.07E-01	7.49E-01	7.70E-01	7.70E-01	7.21E-01	6.71E-01	6.22E-01	5.79E-01	5.65E-01
Trimethylpentane, 2,2,4-	5.06E+00	5.37E+00	5.52E+00	5.52E+00	5.16E+00	4.81E+00	4.46E+00	4.15E+00	4.05E+00
Undecane, n-	8.34E-02	8.85E-02	9.10E-02	9.10E-02	8.51E-02	7.93E-02	7.34E-02	6.84E-02	6.68E-02
Vinyl acetate	1.25E-02	1.33E-02	1.37E-02	1.37E-02	1.28E-02	1.19E-02	1.10E-02	1.03E-02	1.00E-02
Vinyl bromide	3.23E-03	3.43E-03	3.52E-03	3.52E-03	3.30E-03	3.07E-03	2.84E-03	2.65E-03	2.59E-03
Vinyl chloride	1.49E-01	1.58E-01	1.62E-01	1.62E-01	1.52E-01	1.41E-01	1.31E-01	1.22E-01	1.19E-01
Xylene, o	2.79E-01	2.95E-01	3.04E-01	3.04E-01	2.84E-01	2.65E-01	2.45E-01	2.28E-01	2.23E-01
Xylenes (isomers)	1.60E+00	1.69E+00	1.74E+00	1.74E+00	1.63E+00	1.52E+00	1.41E+00	1.31E+00	1.28E+00
Xylenes, m-, p-	2.91E+00	3.08E+00	3.17E+00	3.17E+00	2.97E+00	2.76E+00	2.56E+00	2.38E+00	2.33E+00

7.5 Full Build-Out Estimates Conclusions

Emissions from the production of natural gas in the city of Fort Worth are projected to peak in 2012 and 2013, and in 2015 are projected to decrease to below 2010 levels. The projected peak emission levels occurring in 2012 and 2013 are expected to be 9% higher than emissions during the 2010 baseline year.

As discussed above, natural gas production is primarily dependent on the price that producers will receive. This concept is reflected in the demonstrated relationship between drilling rig and permit activity and natural gas prices. If the wellhead price for natural gas remains relatively low, as it is now, producers do not have economic incentive to invest in new exploration and drilling. Under this scenario, it is expected that total production from currently producing wells and leased wells not yet in production (but currently in development) will increase in the short term, followed by a slow decline.

> ***Key Point: Barnett Shale***
> Based on a reserve estimate of 30 trillion cubic feet of natural gas, over 75% of the available natural gas in the Barnett Shale is projected to be recovered by the end of 2018.

Should wellhead prices for natural gas unexpectedly increase in future years, natural gas production and associated air emissions may be greater than projected. However, it is important to note that the longer natural gas prices remain flat, the lower the peak production rate will be, even with a spike in the price of natural gas. This is because the overall size of the resource, or the reserves, is finite, and the reserve decreases in size as each year passes. The data used in this analysis shows that, based on a reserve estimate of 30 trillion cubic feet of natural gas in the Barnett Shale, approximately one-third has already been depleted, and over 75% will have been recovered by the end of 2018.